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October 27, 1983
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FAA-E-2721/2 dated
9/16/82

DEPARTMENT TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

MICROWAVE LANDING SYSTEM GROUND EQUIPMENT
ANGLE GUIDANCE AND DATA

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MICROWAVE LANDING SYSTEM GROUND EQUIPMENT

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2-1 SCOPE.- This specification defines the requirements for the Azimuth and Elevation Equipment of the MLS Ground Equipment. This equipment transmits the angle guidance and data functions of the MLS in accordance with the interoperability and performance requirements of FAA-STD-022. Figure 2-1 indicates, in the shaded boxes, the equipment that is covered by this specification.

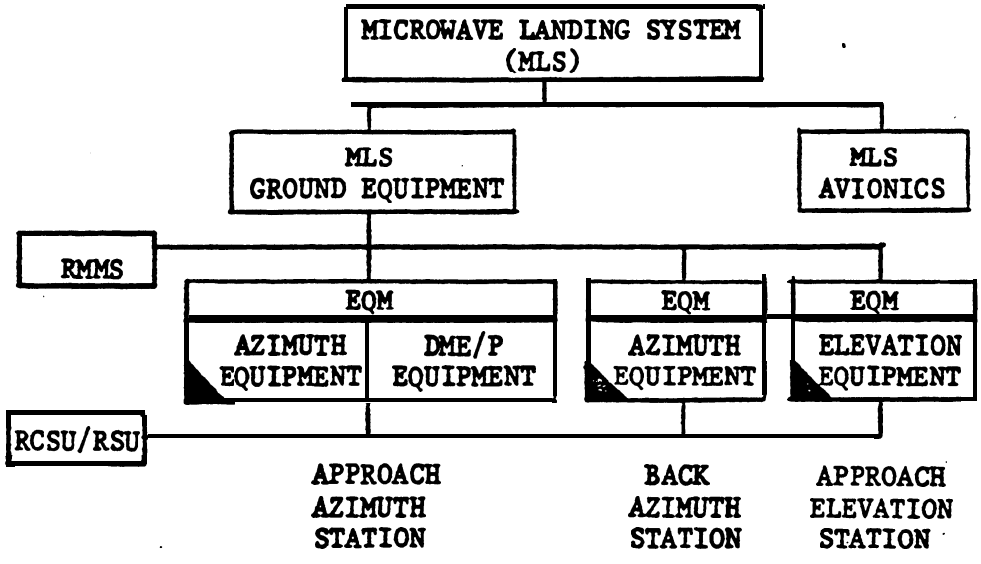
2-1.1 Equipment interrelationships. - The interrelationships of the various equipment and functions of the MLS are specified in FAA-E-2721/1, MLS Ground Equipment, General Requirements. FAA-E-2721 /1 also includes the following requirements for all MLS equipment, and accordingly, they are not contained-in this specification:

(a) General performance requirements such as modularity, electromagnetic compatibility, and maintainability.

(b) Equipment requirements of a general nature such as common test equipment, power equipment, and Equipment Monitors (EQMs).

(c) General documentation requirements such as reliability, and maintainability plans.'

Figure 2-1. MLS Block Diagram



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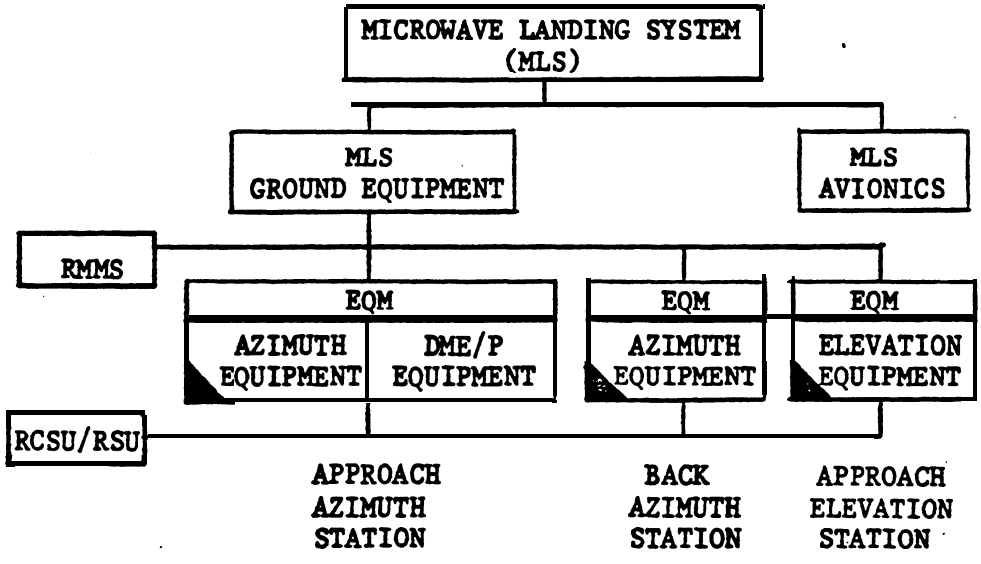

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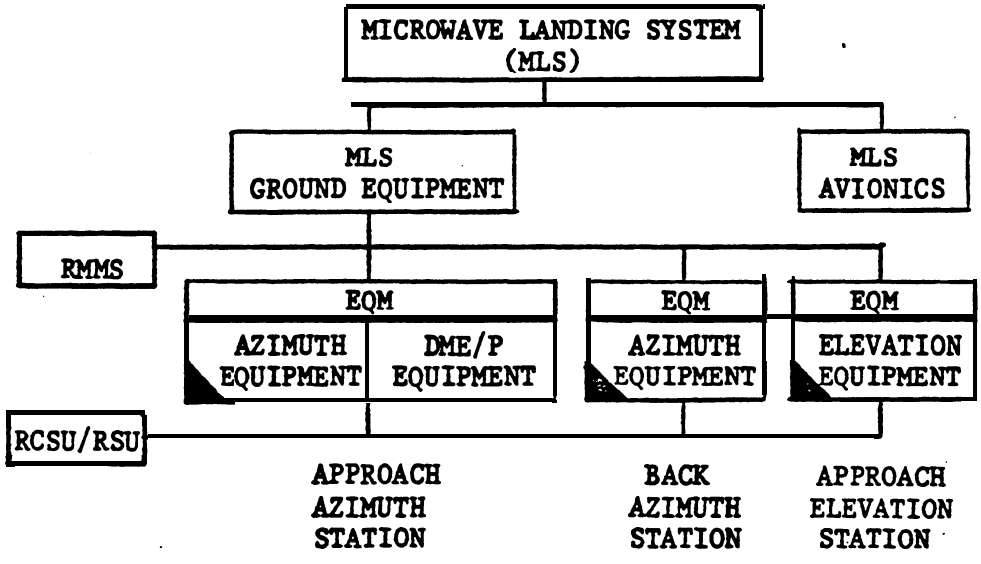

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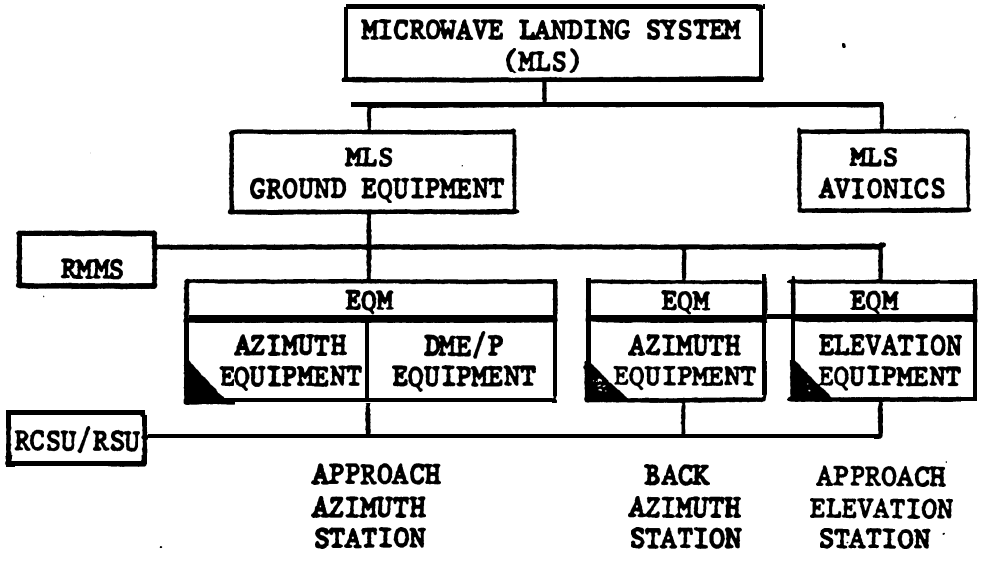

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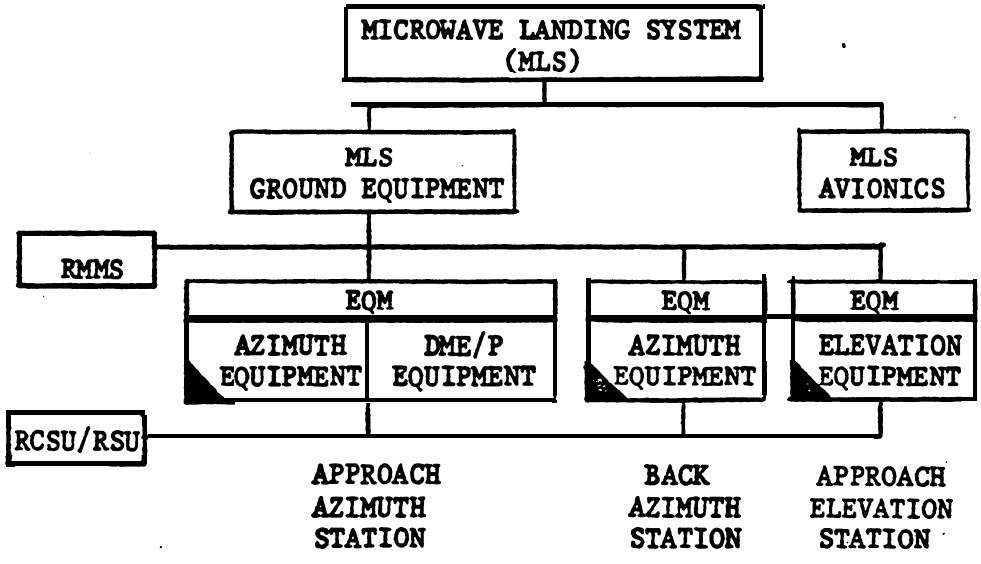

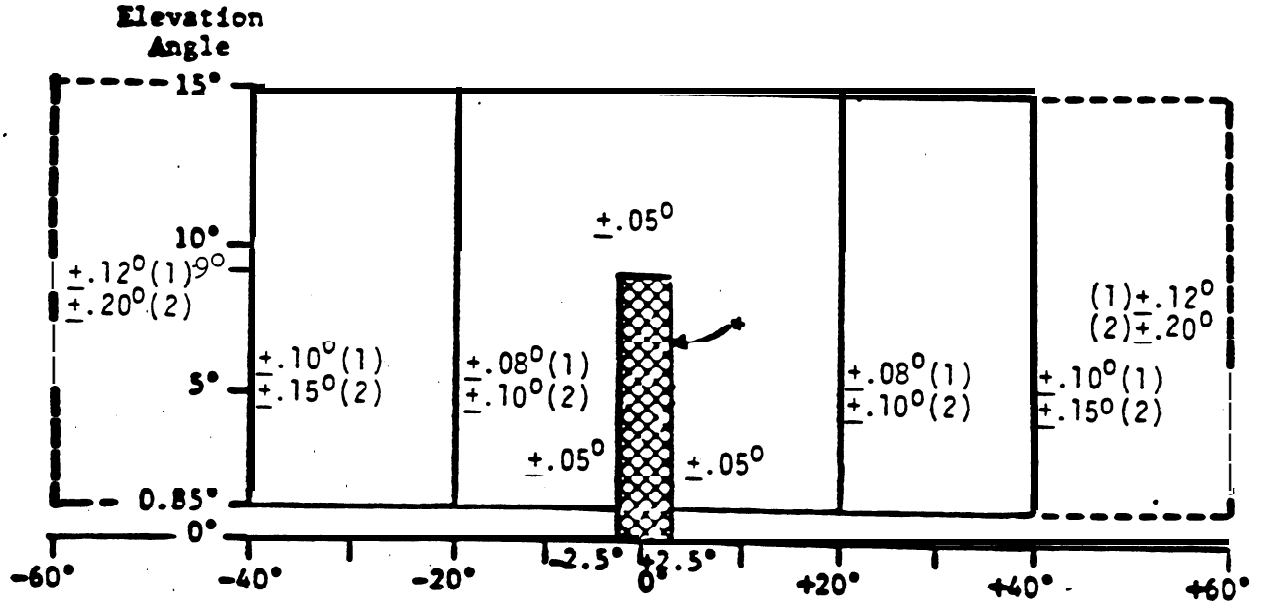

Azimuth Angle

* See Table 2-1 for requirements in this area.

NOTE: Dashed contours apply only to antennas providing ±60° of lateral coverage.

Figure 2-2. Contours of PFE Limits for Azimuth Equipment

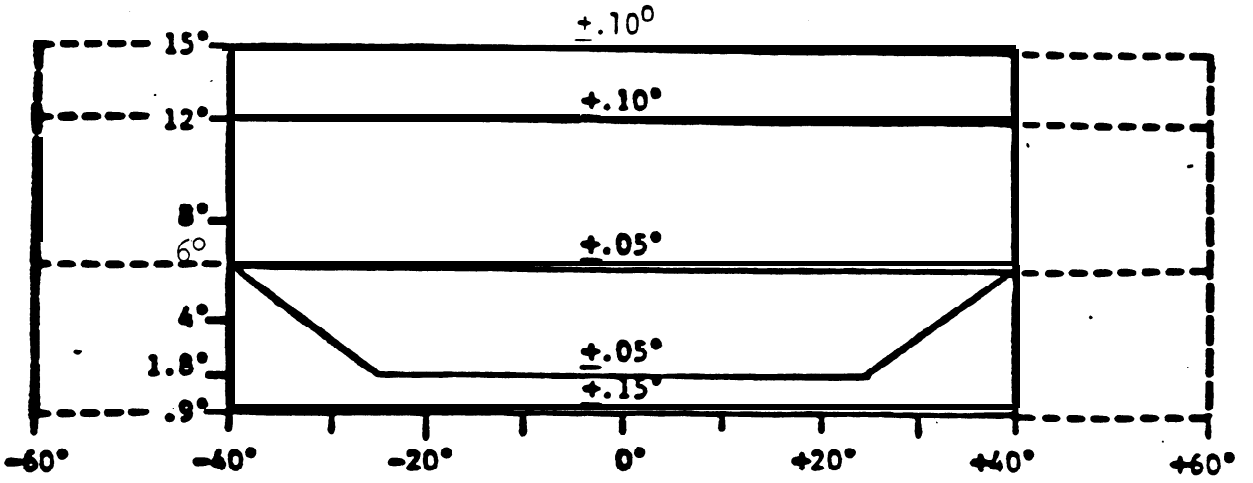

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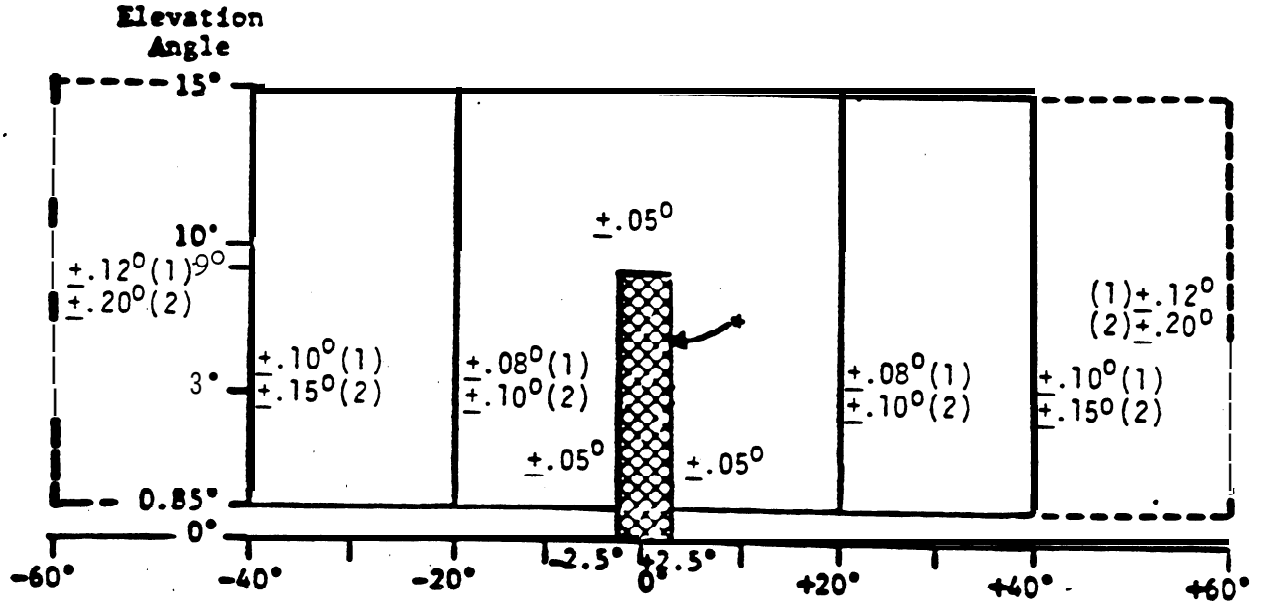
Figure 2-3. Contours of PFE Limits For Elevation Equipment



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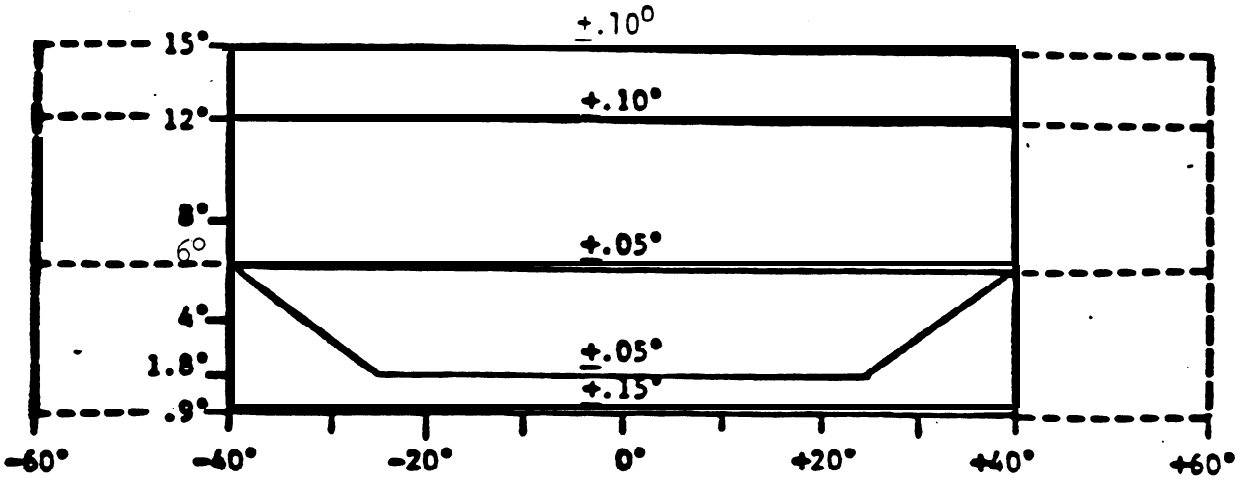

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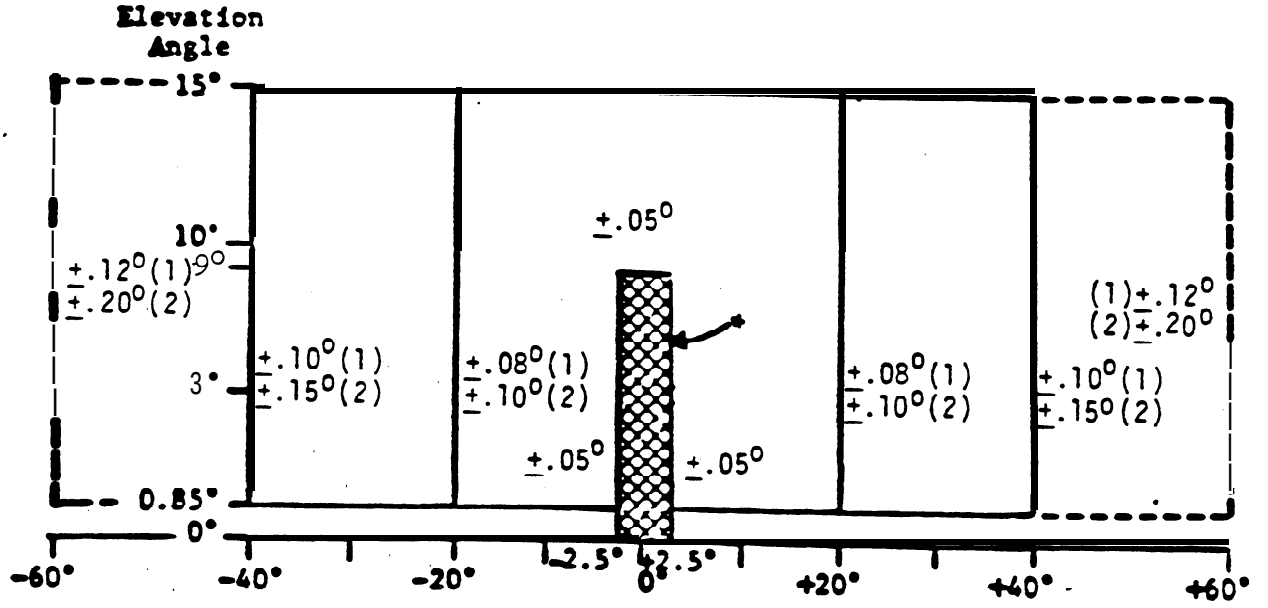

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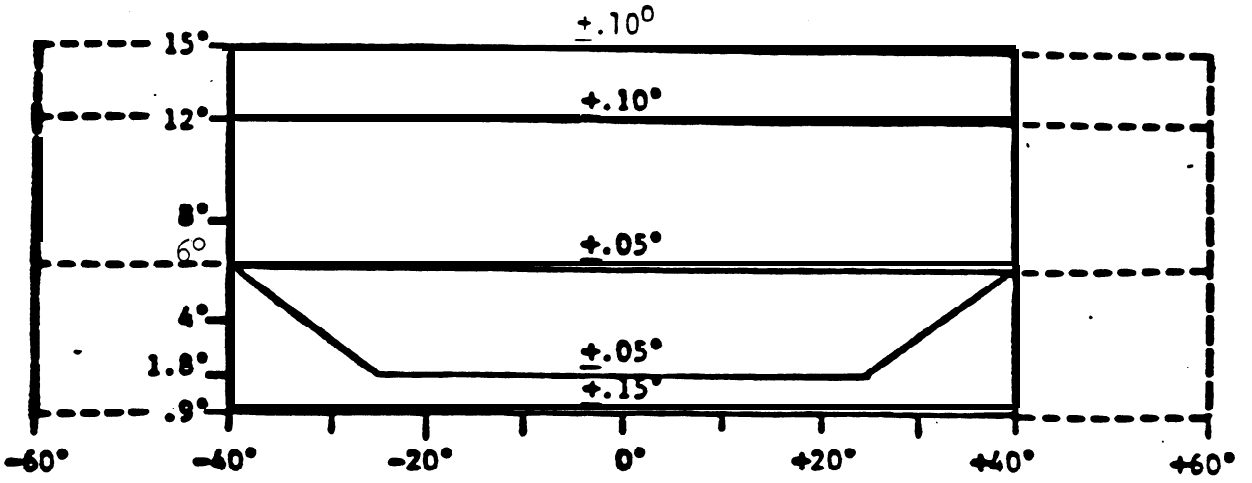

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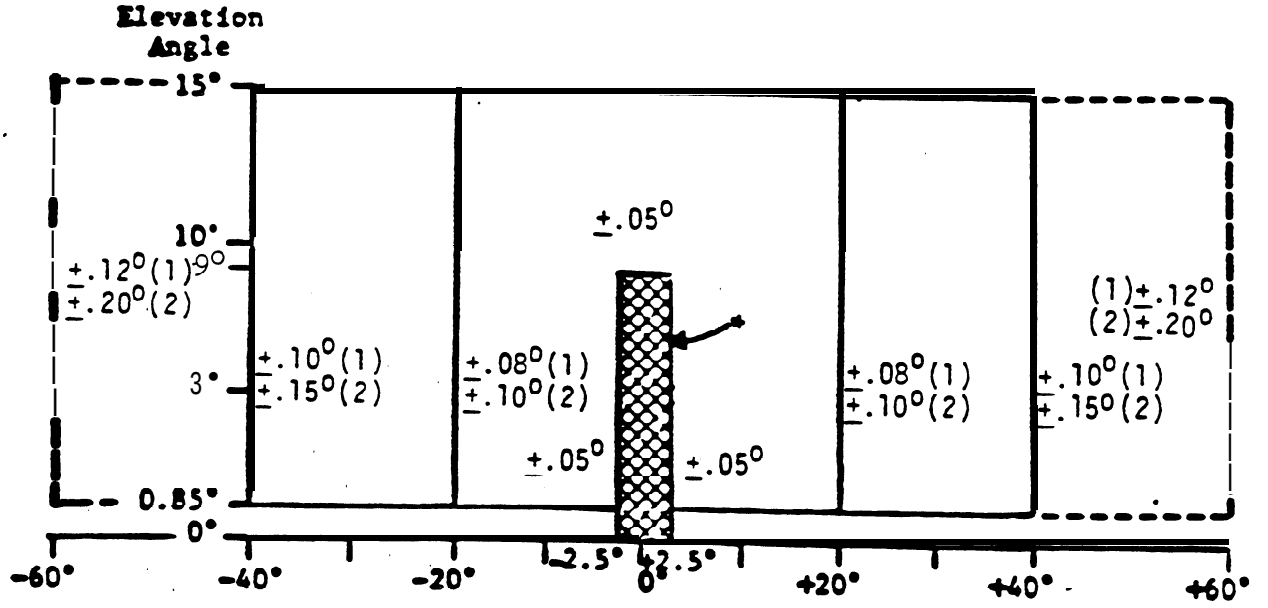

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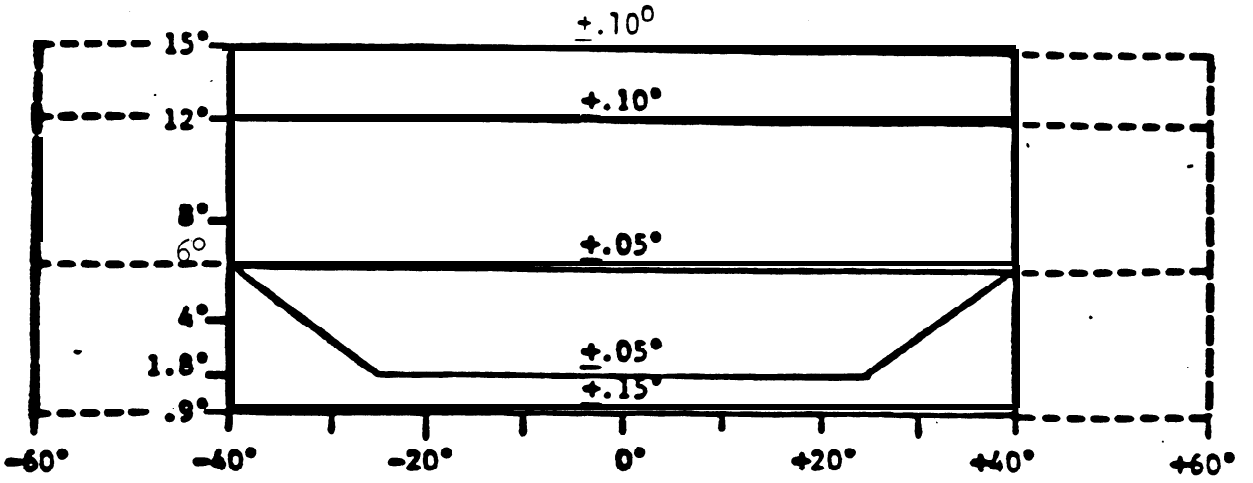

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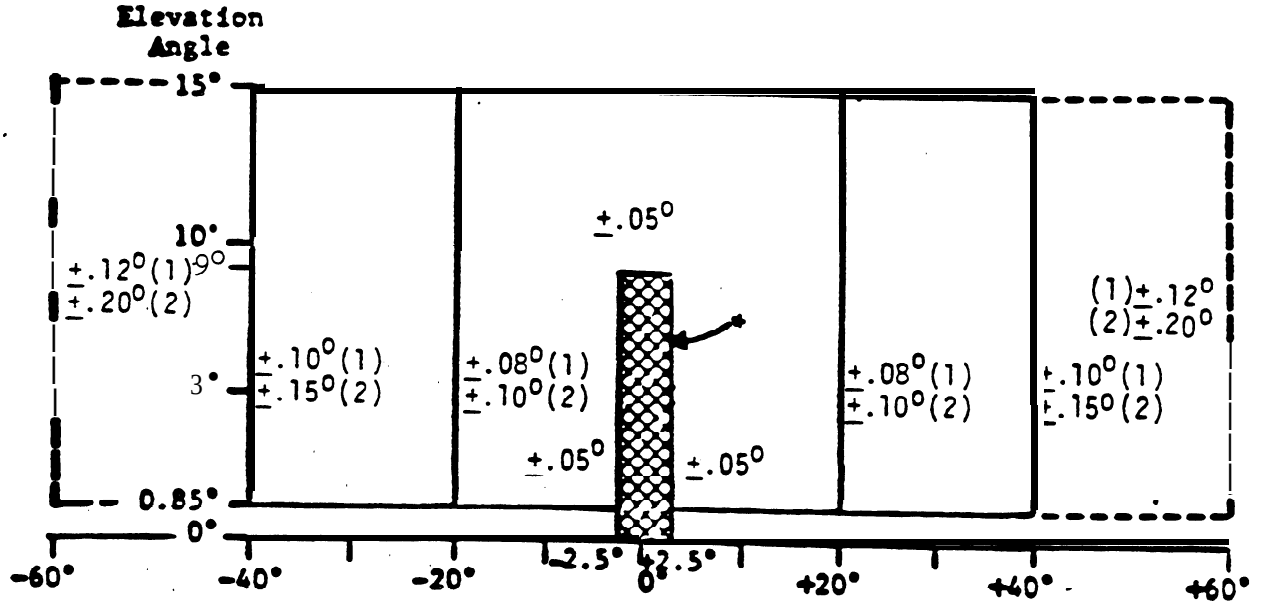

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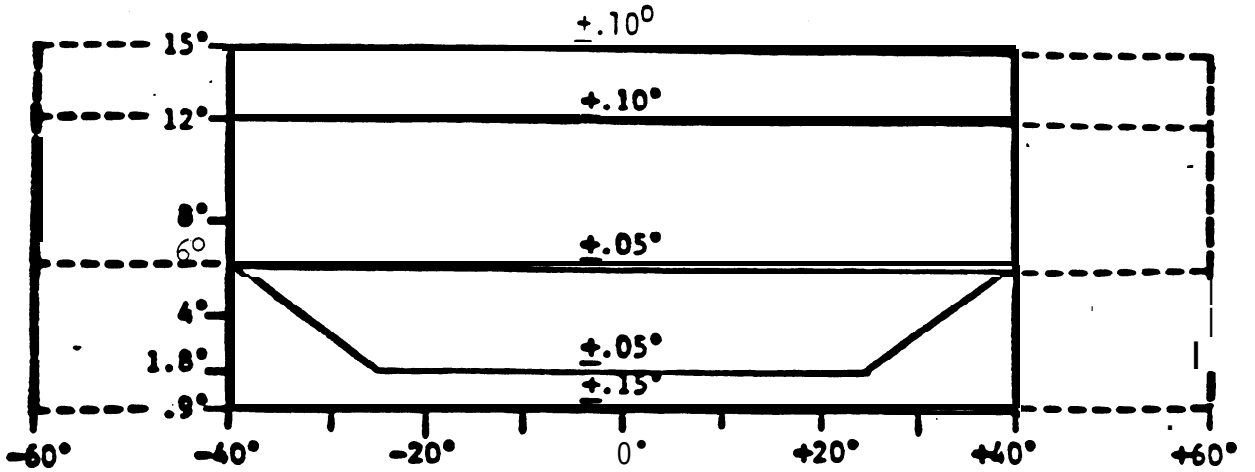

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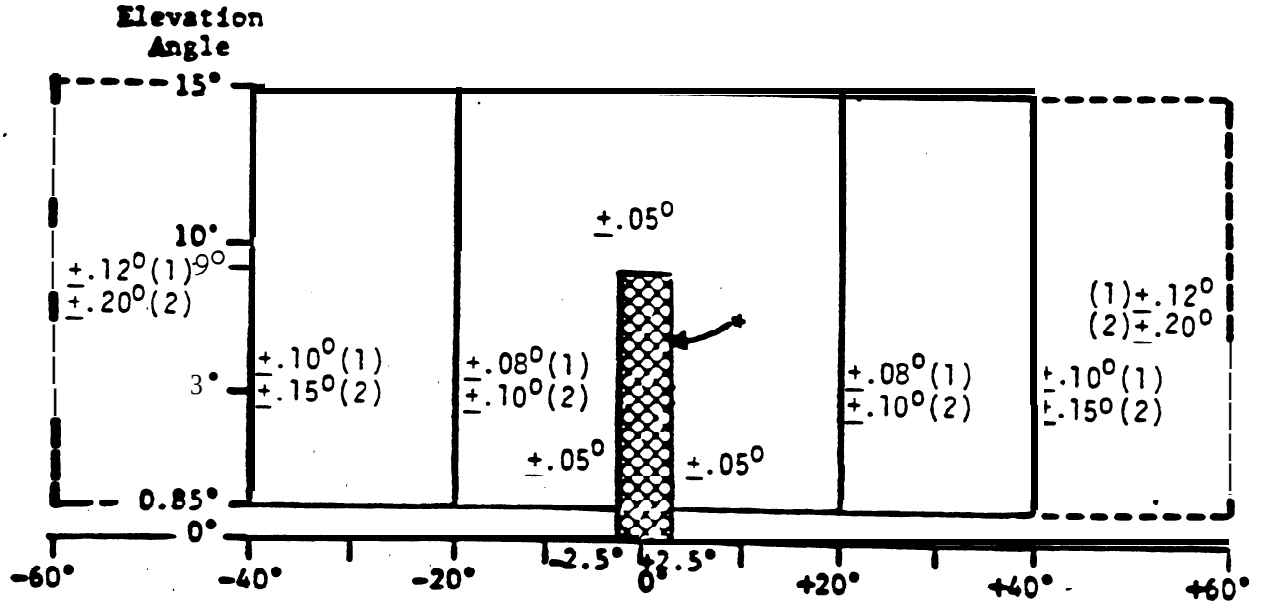

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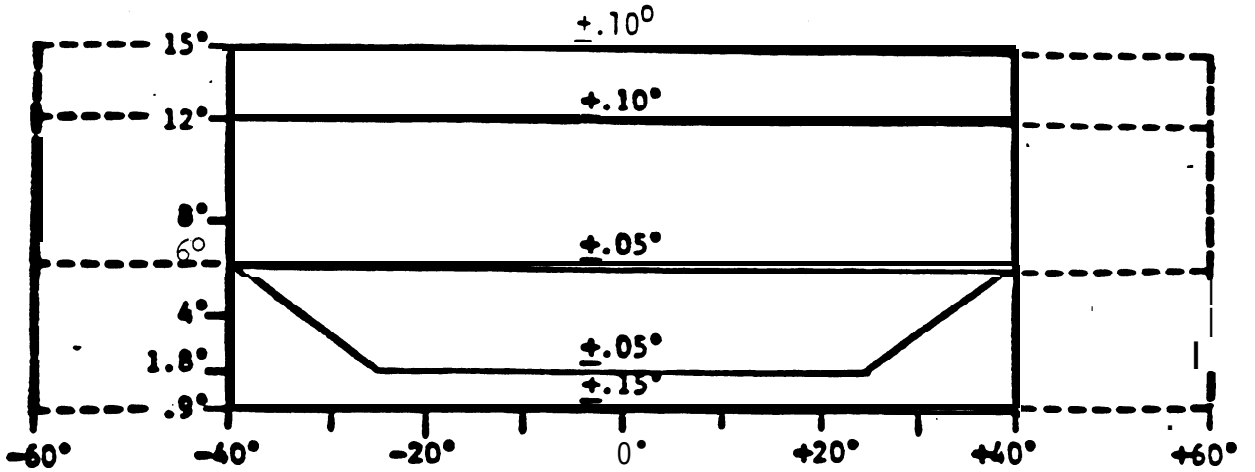

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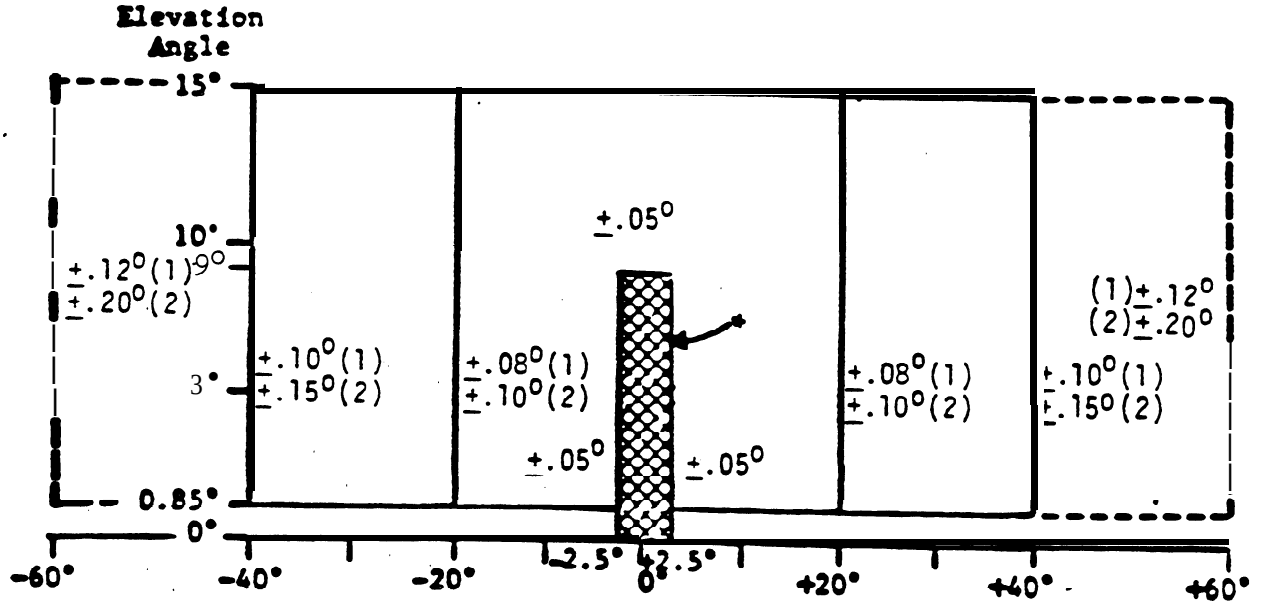

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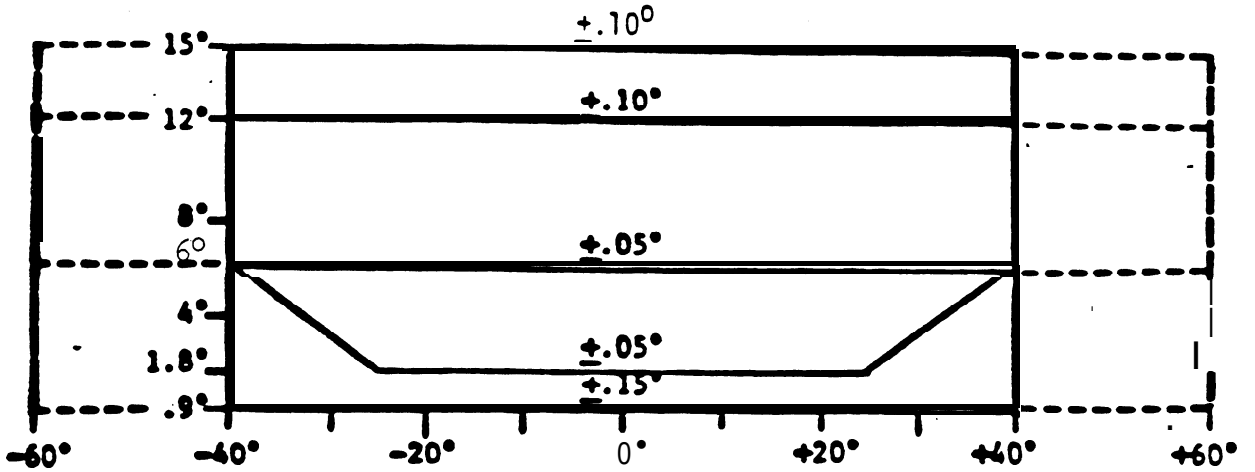

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(a) An integrity alarm initiates an automatic sequence of events to inhibit the erreoneous signal radiation and subsequently restore proper operation by switching to redundant equipment and changing the facility operation& status, if appropriate.

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2-4 QUALITY ASSURANCE AND FAIL-SAFE PROVISIONS

2-4.1 General.- The contractor shall provide and maintain a quality control system in accordance with FAA-STD-016, and shall apply the quality assurance provisions as specified in Section 4 of FA-G-2100. The contractor shall also provide and maintain a software quality program in accordance with FAA-STD-01 8. The objective of these quality control systems and programs shall include, but not be limited to, the validation of signal format, rf characteristics, accuracy and coverage requirements as detailed in this specification and in FAA-STD-022. In addition, the contractor shall incorporate in his quality assurance programs the tests described in the paragraphs below and those listed in Table 2-9 or their equivalent unless they are already included in his test program.

2-4.2 Detailed requirements.. The following tests and conditions shall be included in either the design qualification, production or type test plans. Some tests will be required in more than one plan, as specified below. Table 2-9 summarizes the tests required.

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2-4.2.2 Test frequencies for production tests.- All production equipment shall be tested at one of the following three frequencies: 5031:0 MHz, 5061.0 MHz, 5090.7 MHz, as selected by the FAA Quality/Reliability Officer (QRO).

2-4.2.3 System factory test range tests.- Measurements shall be performed on a suitable antenna range (either near-field or far-field) to demonstrate the ability of each type of equipment specified in 1-3.1 .1 of FAA-E-2721/ 1 to satisfy the coverage, accuracy and beam shape characteristics required by this specification. Specific tests are detailed below.

2-4.2.3.1 Coverage.- Effective radiated power (ERP) shall be demonstrated at least at the nine points indicated by an (x) in Figure 2-4. ERP can be demonstrated by a combination of measured transmitter power (including all interconnect cables losses) and the net antenna gain measured at the points indicated in Figure 2-4.

2-4.2.3.2 Accuracy.- Tests for horizontal coverage accuracy and vertical coverage accuracy shall be as specified in 2-4.2.3.2.1 and 2-4.2.3.2.2. The contractor shall develop the appropriate test procedures to demonstrate compliance with the requirements in a simulated rain condition and over the

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Table 2-9. Quality Assurance Test Requirements

PARAGRAPH REFERENCES	TITLE	TESTS: DESIGN SERVICE	DESIGN NORMAL	TYPE SERVICE	TYPE NORMAL	PRODUCTION	TEST CONDITIONS
	c. Pattern shape						
	o 2-4.2.4.1.4, 2-4.2.3.3	X					Frequency: 5061 Mhz. Temp: -50°C,+30°C, +50°C. Elevation angles: +3, +10°, +1 5°
2-3.4.2	5. Azimuth equipment signal	X		X		X	
2-3.4.2.1	6. Azimuth conversion, high rate and normal rate modes		X				
2-3.4.2.2	7. Switchability, Approach azimuth and back azimuth		X			X	
2-3.4.2.3.1	8. Azimuth/Back Azimuth coverage	X		X		X	
	a. Preamble/Data words ERP	X		X		X	
	b. Scanning Beam ERP	X		X		X	
	c. Clearance ERP	X		X		X	
	d. OCI ERP	X		X		X	
2-3.4.2.3.1	9. Proportional guidance adjustability (AZ)		X				
2-4.3.2.3.2	10. Clearance guidance (AZ)	X		X		X	
2-3.4.2.3.3	11. Out of coverage indication(AZ)	X		X		X	
2-3.4.2.4.1	12. Data transmissions	X		X		X	
2-3.4.2.4.1	13. Basic data	X		X		X	

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PARAGRAPH REFERENCES	TITLE	TESTS: DESIGN SERVICE	DESIGN NORMAL	TYPE SERVICE	TYPE NORMAL	PRODUCTION	TEST CONDITIONS
	c. Pattern shape						
	o 2-4.2.4.1.4, 2-4.2.3.3	X					Frequency: 5061 Mhz. Temp: -50°C,+30°C, +50°C. Elevation angles: +3, +10°, +1 5°
2-3.4.2	5. Azimuth equipment signal	X		X		X	
2-3.4.2.1	6. Azimuth conversion, high rate and normal rate modes		X				
2-3.4.2.2	7. Switchability, Approach azimuth and back azimuth		X			X	
2-3.4.2.3.1	8. Azimuth/Back Azimuth coverage	X		X		X	
	a. Preamble/Data words ERP	X		X		X	
	b. Scanning Beam ERP	X		X		X	
	c. Clearance ERP	X		X		X	
	d. OCI ERP	X		X		X	
2-3.4.2.3.1	9. Proportional guidance adjustability (AZ)		X				
2-4.3.2.3.2	10. Clearance guidance (AZ)	X		X		X	
2-3.4.2.3.3	11. Out of coverage indication(AZ)	X		X		X	
2-3.4.2.4.1	12. Data transmissions	X		X		X	
2-3.4.2.4.1	13. Basic data	X		X		X	

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PARAGRAPH REFERENCES	TITLE	TESTS: DESIGN SERVICE	DESIGN NORMAL	TYPE SERVICE	TYPE NORMAL	PRODUCTION	TEST CONDITIONS
	c. Pattern shape						
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2-3.4.2	5. Azimuth equipment signal	X		X		X	
2-3.4.2.1	6. Azimuth conversion, high rate and normal rate modes		X				
2-3.4.2.2	7. Switchability, Approach azimuth and back azimuth		X			X	
2-3.4.2.3.1	8. Azimuth/Back Azimuth coverage	X		X		X	
	a. Preamble/Data words ERP	X		X		X	
	b. Scanning Beam ERP	X		X		X	
	c. Clearance ERP	X		X		X	
	d. OCI ERP	X		X		X	
2-3.4.2.3.1	9. Proportional guidance adjustability (AZ)		X				
2-4.3.2.3.2	10. Clearance guidance (AZ)	X		X		X	
2-3.4.2.3.3	11. Out of coverage indication(AZ)	X		X		X	
2-3.4.2.4.1	12. Data transmissions	X		X		X	
2-3.4.2.4.1	13. Basic data	X		X		X	

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	c. Pattern shape						
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2-3.4.2	5. Azimuth equipment signal	X		X		X	
2-3.4.2.1	6. Azimuth conversion, high rate and normal rate modes		X				
2-3.4.2.2	7. Switchability, Approach azimuth and back azimuth		X			X	
2-3.4.2.3.1	8. Azimuth/Back Azimuth coverage	X		X		X	
	a. Preamble/Data words ERP	X		X		X	
	b. Scanning Beam ERP	X		X		X	
	c. Clearance ERP	X		X		X	
	d. OCI ERP	X		X		X	
2-3.4.2.3.1	9. Proportional guidance adjustability (AZ)		X				
2-4.3.2.3.2	10. Clearance guidance (AZ)	X		X		X	
2-3.4.2.3.3	11. Out of coverage indication(AZ)	X		X		X	
2-3.4.2.4.1	12. Data transmissions	X		X		X	
2-3.4.2.4.1	13. Basic data	X		X		X	

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	c. Pattern shape						
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2-3.4.2	5. Azimuth equipment signal	X		X		X	
2-3.4.2.1	6. Azimuth conversion, high rate and normal rate modes		X				
2-3.4.2.2	7. Switchability, Approach azimuth and back azimuth		X			X	
2-3.4.2.3.1	8. Azimuth/Back Azimuth coverage	X		X		X	
	a. Preamble/Data words ERP	X		X		X	
	b. Scanning Beam ERP	X		X		X	
	c. Clearance ERP	X		X		X	
	d. OCI ERP	X		X		X	
2-3.4.2.3.1	9. Proportional guidance adjustability (AZ)		X				
2-4.3.2.3.2	10. Clearance guidance (AZ)	X		X		X	
2-3.4.2.3.3	11. Out of coverage indication(AZ)	X		X		X	
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2-3.4.2	5. Azimuth equipment signal	X		X		X	
2-3.4.2.1	6. Azimuth conversion, high rate and normal rate modes		X				
2-3.4.2.2	7. Switchability, Approach azimuth and back azimuth		X			X	
2-3.4.2.3.1	8. Azimuth/Back Azimuth coverage	X		X		X	
	a. Preamble/Data words ERP	X		X		X	
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	c. Clearance ERP	X		X		X	
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	a. Preamble/Data words ERP	X		X		X	
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	c. Clearance ERP	X		X		X	
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